FIRST PARTNERSHIP WORKSHOP
APRIL 29
LBNL/UCD scientists and strategic leaders

OBJECTIVES:

- Gain better understanding of LBNL and UCD strengths in the predictive agriculture realm.
- Articulate key scientific questions/deliverables
- Refine mission and vision of UCD-LBNL Predictive Agriculture Initiative.
- Discuss research opportunities and state/federal movements to launch the initiative (S&T centers, precision agriculture hub, PCAST Agricultural Preparedness Report: http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_agriculture_20121207.pdf
- Evaluate San Joaquin Valley as a possible focal test bed for the initiative
- Discuss partnership leveraging with the UCD Center for Regional Change (J. London), KSS and other ongoing efforts
- Discuss near-term collaborations by linking and extending ongoing activities at UCD-LBNL.

AGENDA

Transformative advances in predictive agriculture are needed to foster a new class of sustainable agricultural solutions. Advancing predictive agriculture requires substantial improvement and connection among several research fronts, which motivate the three key themes of this session: understanding agricultural system components, couplings, and resource demands; computational infrastructure, including knowledgebase, simulation, big data, and decision systems; field site test beds; and advanced agricultural system sensing.

The workshop will begin with oral theme-based presentations presented by UCD-LBNL co-chairs. The intent of these presentations is to lay a foundation for theme-based breakout sessions, which will be organized around a suite of questions developed by co-chairs. Breakout session report-outs will be given in the afternoon, followed by discussions geared toward meeting the objectives identified for this first meeting.

9:00-10:00 INTRODUCTION: The UCD-LBNL Partnership and the Predictive Agriculture Initiative

- Welcome and Objectives (Jan, Susan)
- Opportunity Landscape, incl PCAST (Mary Maxon, Martha Krebs)
- Overview of Relevant UCD institutional programs/centers (Jan)
- Overview of Relevant LBNL capabilities/programs (Susan)

10:00-11:30 THEME 1: Agricultural Systems: Key components, Couplings, Resource Demands and associated Impacts.

- Presentation – LBNL Co-Chair: Janet Jansson (LBNL), Lara Keupers (LBNL), Tom Tomich (UCD), Chris van Kessel (UCD), Kate Scow (UCD)
- General Discussion

Developing a mechanistic, predictive framework for agricultural systems requires advancing understanding of the agricultural system components and their interactions and an understanding resource demands and impacts associated with that managed system. Examples of critical

sustainable agricultural system components and resources topics with demands/impacts that could be considered under this theme include:

- *Soil/plant/microbe genomics and phenomics under managed ecosystem and climate change stresses*
- *Agricultural water/energy use and availability/sustainability*
- *Emerging pests, pathogens and invasive agents*
- *Sustainable soil systems*
- *Climate change impacts on agriculture sustainability, mitigation and adaptation*
- *Markets and market effects (e.g. bioenergy, bioproducts, land use changes and impacts).*

11:30-12:15 Break and Lunch

12:15-12:45 THEME 2: Advanced Infrastructure and Simulation

- Presentation – Susan Ustin (UCD), Deb Agarwal /Paramvir Dehal (LBNL), Paul Ullrich (UCD), Graham Fogg (UCD)
- Discussion (20 min)

Advanced capabilities are needed to transition multi-scale, multi-type data sets into information systems, and then eventually to predictions and web-enabled knowledge discovery. This theme could include consideration of knowledgebase, simulation and decision frameworks and well as field test beds needed to advance predictive agriculture. Examples of topics that could be considered under this theme include:

- *Predictive models for soil-plant-microbe interactions*
- *Predictive models for managed ecosystems in context of regional water-energy systems*
- *Predicting Impacts of climate change on managed ecosystem sustainability*
- *Systems Biology Knowledgebase (KBASE)*
- *Environmental databases and agricultural big data*
- *KSS and the San Joaquin National Case Study Site and/or other potential test beds*

12:45-1:15 THEME 3: Next Generation Agricultural System Sensing and Management Strategies

- Presentation –Josh Heazelwood (LBNL), Henrik Scheller (LBNL), Nigel Quinn (LBNL), Jan Hopmans (UCD), Randy Dahlgren (UCD)
- Discussion (20 min)

This theme focuses on the next generation of environmental sensors for measuring critical microbiological, hydrological, geochemical and atmospheric parameters needed for predictive agriculture as well as on the next generation strategies for enhancing crop production while mitigating environmental effects. Example topics could include:

- *Sensors: Measurement requirements, space-time sampling demands to observe multiscale properties, requirements for adaptivity*
- *Fertilization and sustainable nutrient practices.*
- *Soil and plant synthetic biology to optimize system performance*

1:15-2:30 FACILITATED BREAKOUT SESSIONS

Format TBD.

2:30-2:45 BREAK

2:45-3:30 BREAKOUT SESSION REPORT-OUTS

FORMAT TBD. Possible:

- Theme 1 (led by co-chairs)
- Theme 2 (led by co-chairs)
- Theme 3 (led by co-chairs)

3:30-4:30 ORGANIZED DISCUSSION AND NEXT STEPS

- **UCD-LBNL Organization Committee Rep(s) presentation [**Jan Hopmans, Martha Krebs, Kate Scow, Chris van Kessel, Mary Maxon, Adam Arkin, Bill Collins, Susan Hubbard]

Examples of questions that may be posed to frame the discussion include:

- What are the most unique and complementary LBNL and UCD strengths to capitalize on for the predictive agriculture initiative?
- How to best link or include other topics not discussed today (such as political, social, economic?).
- What aspects are clearly missing?
- What are near and longer term funding targets?
- How should/could industry be engaged?
- Are there some collaboration projects that can potentially be initiated now, through linking ongoing projects or through augmenting with institutional seed funding?
- Next Steps Action Items